I/We claim:

1. An X-ray fluorescence system comprising:

an X-ray source;

an X-ray focusing element with an input and an output end, the input end in proximity to the X-ray source; and

an aperture disposed on the output end of the focusing element so as to substantially block unfocused X-rays, while allowing substantially complete transmission of focused X-rays.

2. A system according to claim 1, the aperture including a substantially X-ray opaque material

3. A system according to claim 1, the aperture including a tapered through opening.

4. A system according to claim 3, the tapered through opening including a larger opening in proximity to the output end of the focusing element.

5. A system according to claim 3, the tapered through opening including a taper angle corresponding substantially to a focus angle of the X-ray focusing element.

6. A microscopic X-ray fluorescence system comprising:

an X-ray source;

an X-ray focusing element with an input and an output end, the input end vacuum sealed to the X-ray source; and

a substantially X-ray opaque aperture vacuum sealed to the output end of the focusing element, the aperture including a tapered through opening with a larger opening of the tapered opening in proximity to the output end of the focusing element, the aperture substantially blocking unfocused X-rays, while allowing substantially complete transmission of focused X-rays.

7. An aperture in an X-ray fluorescence system comprising;

a first end;

a second end; and

a passage connecting the first end and the second end, the first end connectable to an X-ray focusing element of the X-ray fluorescence system, the aperture to substantially block unfocused X-rays in the X-ray fluorescence system.

8. An aperture according to claim 7, the aperture including a substantially X-ray opaque material.

9. An aperture according to claim 7, wherein the passage is a tapered passage section with a taper angle corresponding substantially to a focus angle of the X-ray focusing element.

10. An aperture according to claim 7, the aperture further comprising an X-ray transparent vacuum seal disposed at the first end or the second end.

11. An aperture in an microscopic X-ray fluorescence system comprising:

an input end;

an output end;

an X-ray transparent vacuum seal at the output end; and

a tapered through passage connecting the input end and the output end, the input end connectable to an X-ray focusing element of the X-ray fluorescence system, the aperture to substantially block unfocused X-rays in the X-ray fluorescence system.

12. An X-ray fluorescence system comprising:

an X-ray source, the source arranged to direct X-rays substantially perpendicular to a sample in a testing position;

an imaging device for imaging the sample in a viewing position; and

an automatic translation device cooperating with the imaging device and the X-ray source to translate between the viewing position and the testing position.

13. A system according to claim 12, further comprising a distance determining device cooperating with the imaging device to determine a distance between the sample and the imaging device.

14. A system according to claim 13, further comprising a positioning device cooperating with the distance determining device to position the sample with an accuracy that is at least within a radius of a focused X-ray spot of the X-ray source.

15. A system according to claim 12, further comprising a distance determining device cooperating with the imaging device to determine a distance between the sample and the X-ray source.

16. A system according to claim 15, further comprising a positioning device cooperating with the distance determining device to position the sample with an accuracy that is at least within a radius of a focused X-ray spot of the X-ray source.

17. A system according to claim 12, further comprising a positioning device cooperating with the translation device to position the sample with an accuracy that is at least within a radius of a focused X-ray spot of the X-ray source.

18. A system according to claim 12, further comprising a position detecting device cooperating with the automatic translation device

19. A system according to claim 18, the automatic translation device using information from the position detecting device to avert contact between the sample and the X-ray source.

20. A system according to claim 18, the automatic translation device using information from the position detecting device to avert contact between the sample and the imaging device.

21. A system according to claim 12, the imaging device configured to image the sample from a substantially perpendicular viewpoint.

22. A system according to claim 12, the X-ray source producing a focused X-ray spot.

23. A system according to claim 12, the translation device maintaining a three dimensional accuracy between the viewing position and the testing position, the accuracy within a radius of a focused X-ray spot of the X-ray source.

24. A system according to claim 12, the translation device translating the sample between the testing position and the viewing position.

25. A system according to claim 12, the translation device translating the X-ray source and imaging device between the testing position and the viewing position.

26. A microscopic X-ray fluorescence system comprising:

an X-ray source, the source arranged to direct X-rays substantially perpendicular to a sample in a testing position;

an imaging device for imaging the sample in a viewing position; and

an automatic translation device cooperating with the imaging device and the X-ray source to translate between the viewing position and the testing position and repeatably position the sample in three dimensions in the testing position with an error of 75 microns or less in a direction normal to the sample and with an error of 5 microns or less in a plane of the sample.

27. An X-ray fluorescence system comprising:

an X-ray element with a first end and a second end;

an aperture disposed on the second end of the element; and

a vacuum source connectable to the aperture for evacuating the aperture.

28. A system according to claim 27, further comprising a sample holder positioned in proximity to the aperture to hold a sample, the sample maintained at atmospheric pressure.

29. A system according to claim 27, wherein the X-ray element is an X-ray source.

30. A system according to claim 27, wherein the X-ray element is an X-ray detector.

31. A system according to claim 27, wherein the X-ray element is an X-ray focusing element.

32. A system according to claim 27, wherein the aperture is vacuum sealed to the X-ray element.

33. A system according to claim 27, further comprising an X-ray source vacuum sealed to the first end of the X-ray element.

34. A system according to claim 33, further comprising a vacuum source connectable to the X-ray source for evacuating the X-ray source.

35. A system according to claim 34, wherein the vacuum source connectable to the aperture and the vacuum source connectable to the X-ray source are the same vacuum source.

36. An X-ray path in a microscopic X-ray fluorescence system, the path comprising:

an X-ray source;

an X-ray focusing element with an input end and an output end, the input end vacuum sealed to the X-ray source;

a focusing aperture vacuum sealed to the second end of the focusing element; and

a vacuum source connectable to the X-ray path for evacuating the path.

37. An X-ray path in a microscopic X-ray fluorescence system, the path comprising:

an X-ray detector;

a detector aperture vacuum sealed to the X-ray detector; and

a vacuum source connectable to the X-ray path for evacuating the path.

38. An X-ray fluorescence system comprising:

a detector; and

an aperture cooperating with the detector to provide an X-ray path, the X-ray path having X-ray transmissive characteristics that differ from atmospheric X-ray transmissive characteristics.

39. A system according to claim 38, wherein the system is a microscopic X-ray fluorescence system.

40. A system according to claim 38, wherein the aperture has a tapered conical shape with an X-ray transmissive window.

41. A system according to claim 38, wherein the aperture is vacuum evacuable to thereby provide a vacuum evacuated X-ray path.

42. A system according to claim 38, wherein the aperture is removeable from the detector.

43. A method for detecting elements with low atomic numbers in an X-ray fluorescence system comprising:

positioning a sample for X-ray illumination by the X-ray fluorescence system;

evacuating an X-ray focusing element with a vacuum source; and

illuminating the sample with X-rays focused by the X-ray focusing element while the sample remains at atmospheric pressure.

44. A method according to claim 43, further comprising evacuating a focusing aperture disposed on an output end of the X-ray focusing element.

45. A method according to claim 43, further comprising evacuating an X-ray source disposed on an input end of the X-ray focusing element.

46. A method according to claim 43, further comprising evacuating an X-ray detector.

47. A method according to claim 46, further comprising evacuating a detector aperture disposed on the X-ray detector.

48. A method according to claim 43, wherein evacuating the X-ray focusing element includes evacuating to less than about 1 milli. Torr.

49. A method according to claim 43, further comprising detecting X-ray fluorescence from elements with atomic numbers above 13.